AMENDMENTS TO THE CLAIMS

Claims 1-4 (cancelled).

5. (currently amended) Apparatus for ascertaining a signature characteristic of a collection of signals for discriminating between and among such signals and for classifying other signals using said signature, said apparatus comprising:

   a) a dictionary comprising a plurality of prototype signals;

   b) means for selecting a specific prototype signal such that for at least one signal of the collection ~~the~~ an inner product with the selected prototype is non-zero;

   c) means for recording the selected prototype signal;

   d) means for subtracting from each signal in the collection ~~the~~ a projection of that signal on the specific prototype signal and for redesignating the result of the subtraction as the signal in the collection for the next iteration;

   e) means for imposing a stop criterion; and

   f) means for directing the apparatus back to means (b) unless the stop criterion is met.

6. (currently amended) Apparatus for ascertaining a signature characteristic of a collection of signals for discriminating between and among such signals and for classifying other signals using said signature, comprising:

   a) a dictionary comprising a plurality of prototype signals;

b) means for determining an inner product between each of the signals in the collection and at least one of the prototype signals in the dictionary;

c) means for selecting a specific prototype signal such that for at least one signal of the collection the inner product of the specific prototype signal with the at least one signal of the collection is non-zero;

d) means for recording the specific prototype signal and the inner product of each of the signals from the collection with the prototype signal;

e) means for subtracting from each signal in the collection the a projection of the that signal on the specific prototype signal and for redesignating the result of the subtraction as the signal in the collection for the next iteration;

f) means for imposing a stop criterion; and

g) means for directing the apparatus back to means (b) unless the stop criterion is met.

7. (currently amended) Apparatus for ascertaining a signature characteristic of a collection of signals for discriminating between and among such signals and for classifying other signals using said signature, comprising:

a) a dictionary comprising a plurality of prototype signals;

b) a subdictionary which is a subset of the dictionary;

c) means for determining an inner product p-norm for the signals in the collection for each of the prototype signals in the subdictionary;

d) means for selecting a specific prototype signal in the subdictionary that substantially maximizes said inner product p-norm;

e) means for recording the specific prototype signal and ~~the~~ an inner product of each of the signals from the collection with the prototype signal;

f) means for subtracting from each signal in the collection ~~the~~ a projection of the ~~that~~ signal on the specific prototype signal and for redesignating the result of the subtraction as the signal in the collection for the next iteration;

g) means for imposing a stop criterion; and

h) means for directing the apparatus back to means (c) unless the stop criterion is met.

8. (currently amended) Apparatus for ascertaining a signature characteristic of a collection of signals for discriminating between and among such signals and for classifying other signals using said signature, comprising:

a) a dictionary comprising a plurality of prototype signals;

b) a subdictionary which is a subset of the dictionary;

c) means for determining an inner product p-norm for the signals in the collection for each of the prototype signals in the subdictionary;

d) means for selecting a specific prototype signal in the subdictionary that substantially maximizes said inner product p-norm ;

e) means for determining, for each individual signal in the collection, a separate prototype

   signal that locally maximizes the magnitude of ~~the~~ an inner product of the separate

   prototype signal with the individual signal from the collection;

f) means for recording the separate prototype signal and the maximized inner product of

   each individual signal from the collection with each determined separate prototype signal;

g) means for subtracting from each signal in the collection ~~the~~ a projection of the ~~that~~ signal

   on the specific prototype signal and for redesignating the result of the subtraction as the

   signal in the collection for the next iteration;

h) means for imposing a stop criterion; and

i) means for directing the apparatus back to means (c) unless the stop criterion is met.

9. (currently amended) A method for ascertaining and identifying similarities and differences

among members of a collection of signals and for representing a collection of signals in an easily

compared format, comprising the steps of:

a) establishing a dictionary comprising a plurality of prototype signals;

b) selecting a specific prototype signal from the dictionary such that ~~the~~ an inner product of

   said prototype with at least one signal of the collection is non-zero;

c) recording the selected prototype signal and recording its inner product with each of the

   signals from the collection;

d) subtracting from each signal in the collection ~~the~~ a projection of that signal on the selected prototype signal and redesignating the result of the subtraction as the signal in the collection for the next iteration;

e) imposing a stop criterion; and

f) repeating steps (b) through ~~(f)~~ (e) until the stop criterion is met.

10. (currently amended) The method of Claim 9, wherein the step of selecting a specific prototype signal from the dictionary comprises determining which prototype in the dictionary substantially maximizes ~~the~~ an inner product p-norm for the signals in the collection.

11. (previously presented) The method of Claim 9, wherein the step of selecting a specific prototype signal from the dictionary is followed by an additional step of searching for an improved prototype signal choice in the dictionary or in a second dictionary.

12. (previously presented) The method of Claim 9, wherein the dictionary comprises a set of Gabor atoms.

13. (currently amended) A method for ascertaining and identifying similarities and differences among members of a collection of signals and for representing a collection of signals in an easily compared format, comprising the steps of:

a) establishing a dictionary comprising a plurality of prototype signals;

b) selecting a first specific prototype signal from the dictionary such that that ~~the~~ an inner

product of said prototype with at least one signal of the collection is non-zero;

c) for each individual signal in the collection, selecting an improved prototype signal from

the dictionary that is similar to the first specific prototype signal but has a larger inner

product magnitude with ~~the given~~ said each individual signal;

d) recording each improved prototype signal and recording its respective inner product with

the corresponding signal from the collection;

e) subtracting from each signal in the collection ~~the~~ a projection of its respective improved

prototype signal and redesignating the result of the subtraction as the signal in the

collection for the next iteration;

f) imposing a stop criterion; and

g) repeating steps (b) through (f) until the stop criterion is met.

14. (previously presented) The method of Claim 13, wherein the step of selecting a first specific

prototype signal from the dictionary comprises determining which prototype in the dictionary

substantially maximizes ~~the~~ an inner product p-norm for the signals in the collection.

15. (previously presented) The method of Claim 13, wherein the step of selecting an improved

prototype for each individual signal in the collection is conducted by searching a dictionary that

differs from the dictionary used to establish the first specific prototype.

16. (previously presented) The method of Claim 13, wherein the dictionary comprises a set of

Gabor atoms.

17. (previously presented) The method of Claim 13, wherein

    a)   the dictionary comprises a set of prototype signals that are parameterized in at least one

         variable; and

    b)   the step of selecting an improved prototype for each individual signal in the collection is

         constrained in order to limit parameter variation between said improved prototypes.

18. (previously presented) A method of characterizing at least one group of signals and of

expressing and visualizing its characteristics, comprising the steps of

    a)   creating an aggregate collection of signals comprising all groups of interest;

    b)   parameterizing a dictionary of prototype signals in at least one variable;

    c)   applying the method of either Claim 9 or Claim 13 in order to represent each signal in

         said aggregate collection in terms of at least one prototype dictionary element; and

    d)   calculating a parametric mean over at least one group of interest.

19. (previously presented) A method of ascertaining and characterizing similarities and

differences in and between signals or groups of signals and of expressing and visualizing said

characteristics, comprising the steps of:

    a)   creating an aggregate collection of signals comprising all groups of interest;

8

b) applying either the method of Claim 9 or the method of Claim 13 in order to represent each signal in said aggregate collection in terms of at least one prototype dictionary element;

c) determining for each subgroup those component prototype elements selected in step (b) that satisfy a similarity threshold test; and

d) determining for each pair of subgroups those component prototype elements selected in (b) that satisfy a difference threshold test.

20. (previously presented) The method of Claim 19, wherein

a) the dictionary comprises a set of prototype signals that are parameterized in at least one variable; and

b) after applying either the method of Claim 9 or the method of Claim 13, a parametric mean is calculated for each signal group of interest.

21. (previously presented) The method of Claim 19, wherein the similarity threshold test keeps only those components whose mean coefficients are larger in magnitude than some set value.

22. (previously presented) The method of Claim 19, wherein the similarity threshold test keeps only those components whose coefficient and/or other parameter values are sufficiently close to the group mean.

23. (previously presented) The method of Claim 19, wherein the similarity threshold test keeps only those components whose coefficients and/or other parameter values have sufficiently small group variance.

24. (previously presented) The method of Claim 19, wherein the difference threshold test keeps only those components whose coefficients and/or other parameter values differ between groups by more than some threshold amount.

25. (previously presented) The method of Claim 19, wherein the difference threshold test keeps only those components whose squared coefficients and/or other squared parameter values differ between groups by more than some threshold amount.

26. (previously presented) A method of reconstructing a representative average signature signal for a collection of signals and of visualizing said signature signal, comprising the steps of:

a) parameterizing a dictionary of prototype signals in at least one variable;

b) applying either the method of Claim 9 or the method of Claim 13 in order to represent each signal in said collection in terms of at least one prototype dictionary element;

c) calculating a parametric mean over the signal group of interest;

d) sub-selecting two or more prototype elements from the calculated parametric mean set by means of similarity or difference tests; and

e) summing said sub-selected parametric mean prototype elements scaled by their

respective parametric mean coefficient in order to recover a representative signal.

27. (previously presented) A method of reconstructing a signature signal representative of the

similarity or difference between signals or groups of signals within a collection and of visualizing

said signature signal, comprising the steps of:

a) parameterizing a dictionary of prototype signals in at least one variable;

b) applying either the method of Claim 9 or the method of Claim 13 in order to represent

each signal in said collection in terms of at least one prototype dictionary element;

c) calculating a parametric mean for each signal or subgroup of signals;

d) sub-selecting at least one prototype element relevant to the comparison between

subgroups from the calculated parametric mean sets; and

e) summing said sub-selected parametric mean elements scaled by their proportional

coefficients in order to recover a representative signal.

28. (previously presented) A method of ascertaining and characterizing similarities and

differences between a collection of at least one signal and a group of uncorrelated baseline

signals, comprising the steps of:

a) parameterizing a dictionary of prototype signals in at least one variable, including at least

the variable of position;

b) applying either the method of Claim 9 or the method of Claim 13 in order to represent each signal in said collection in terms of at least one prototype dictionary element;

c) calculating a list of parametric mean prototype elements for the collection as a function of position by averaging all parameters except position;

d) calculating the RMS amplitude over all possible positions of each of the parametric mean prototype elements within the baseline signal group; and

e) rescaling the coefficients derived in step (b) by the RMS baseline amplitude values.

29. (previously presented) The method of Claim 28, additionally comprising the step of making comparisons between at least one signal with the baseline data by considering the proportionate change in said signal relative to the baseline for specific selected prototype elements scaled by their RMS amplitude.

30. (currently amended) A ~~Method~~ method of comparing a collection of signals to itself in order to automatically discover components of interest, comprising the steps of:

a) parameterizing a dictionary of prototype signals in at least one variable, including at least the variable of position;

b) applying either the method of Claim 9 or the method of Claim 13 in order to represent each signal in said collection in terms of at least one prototype dictionary element;

c) calculating a list of parametric mean prototype elements for the collection as a function of position by averaging all parameters except position;

d) calculating the RMS amplitude over all possible positions of each of the parametric mean

prototype elements within the collection of signals; and

e) rescaling the coefficients derived in (b) by the RMS baseline amplitude values.

31. (previously presented) A method of data compression and retrieval for a collection of

signals and of noise reduction for a collection of signals, comprising the steps of:

a) applying either the method of Claim 9 or the method of Claim 13 in order to represent

each signal in said collection in terms of at least one prototype dictionary element;

b) applying at least one threshold to sub-select a list of at least one prototype element from

those derived in step (a);

c) storing information sufficient to describe said sub-selected prototype elements, along with

respective coefficients for each signal; and

d) reconstructing each signal from the sum of stored prototype elements multiplied by their

respective coefficients.

32. (previously presented) A method of data compression and retrieval for a collection of

signals and of noise reduction for a collection of signals, comprising the steps of

a) parameterizing a dictionary of prototype signals in at least one variable, including at least

the variable of position;

b) designating a group of baseline signals;

c) applying either the method of Claim 9 or the method of Claim 13 in order to represent each signal in said collection in terms of at least one prototype dictionary element;

d) calculating a list of parametric mean prototype elements for the collection as a function of position by averaging all parameters except position;

e) calculating the RMS amplitude over all possible positions of each of the parametric mean prototype elements within the baseline signal group;

f) rescaling the coefficients derived in step (c) by the RMS baseline amplitude values;

g) applying at least one threshold to sub-select a list of at least one prototype element from those derived in step (c);

h) storing information sufficient to describe said sub-selected prototype elements, along with respective coefficients for each signal; and

i) reconstructing each signal from the sum of stored prototype elements multiplied by their respective coefficients.

33. (previously presented) The method of Claim 32, wherein the designated baseline signal group includes at least one signal from the target collection of signals to be processed.

34. (previously presented) A method of data compression and retrieval for a collection of signals and of noise reduction for a collection of signals, comprising the steps of

a) applying either the method of Claim 9 or the method of Claim 13 in order to represent each signal in said collection in terms of at least one prototype dictionary element, with

stopping criteria selected such that the algorithm will end with signal residuals smaller in magnitude than a desired resolution;

b) storing information sufficient to describe the selected prototype dictionary elements, along with respective coefficients for each signal; and

c) reconstructing each signal from the sum of stored prototype elements multiplied by their respective coefficients.

35. (previously presented) A method of data compression and retrieval for a collection of signals and of noise reduction for a collection of signals, comprising the steps of

a) parameterizing a dictionary of prototype signals in at least one variable, including at least the variable of position;

b) designating a group of baseline signals;

c) applying either the method of Claim 9 or the method of Claim 13 in order to represent each signal in said collection in terms of at least one prototype dictionary element, with stopping criteria selected such that the algorithm will end with signal residuals smaller in magnitude than a desired resolution;

d) calculating a list of parametric mean prototype elements for the collection as a function of position by averaging all parameters except position;

e) calculating the RMS amplitude over all possible positions of each of the parametric mean prototype elements within the baseline signal group;

f) rescaling the coefficients derived in step (c) by the RMS baseline amplitude values;

g) storing information sufficient to describe said sub-selected prototype elements, along with respective coefficients for each signal; and

h) reconstructing each signal from the sum of stored prototype elements multiplied by their respective coefficients.

36. (previously presented) The method of Claim 35, wherein the designated baseline signal group includes at least one signal from the target collection of signals to be processed.

37. (previously presented) A method of data compression for a sequential collection of signals, comprising the steps of

a) storing information sufficient to reconstruct a first signal;

b) creating a sub-collection of signals comprising at least one previously stored signal and at least one additional signal;

c) applying either the method of Claim 9 or the method of Claim 13 in order to represent each signals in said sub-collection in terms of at least one prototype dictionary element;

d) sub-selecting those prototype elements that represent differences between each additional signal and the previous signal or group of signals within the sub-collection; and

e) storing information sufficient to describe said sub-selected prototype elements, along with respective coefficients for each additional signal in the sub-collection.

38. (previously presented) A method of data compression for a sequential collection of signals, comprising the steps of:

a) parameterizing a dictionary of prototype signals in at least one variable, including at least the variable of position;

b) storing information sufficient to reconstruct a first signal;

c) creating a sub-collection of signals comprising at least one previously stored signal and at least one additional signal;

d) designating a group of baseline signals;

e) applying either the method of Claim 9 or the method of Claim 13 in order to represent each signal in said collection in terms of at least one prototype dictionary element;

f) calculating a list of parametric mean prototype elements for the collection as a function of position by averaging all parameters except position;

g) calculating the RMS amplitude over all possible positions of each of the parametric mean prototype elements within the baseline signal group;

h) rescaling the coefficients derived in step (e) by the RMS baseline amplitude values;

f) sub-selecting those prototype elements that represent differences between each additional signal and the previous signal or group of signals within the sub-collection; and

i) storing information sufficient to describe said sub-selected prototype elements, along with respective coefficients for each additional signal in the sub-collection.

39. (previously presented) The method of Claim 38, wherein the designated baseline signal

group includes at least one signal from the target collection of signals to be processed.

40. (previously presented) A method of automatically re-aligning signals with unknown jitter

variations in at least one parameter in order to compensated for said jitter, comprising the steps

of:

    a) creating an aggregate collection of the signals of interest;

    b) parameterizing a dictionary of prototype signals in at least one variable, including at least

        those variables to be re-aligned;

    c) applying either the method of Claim 9 or the method of Claim 13 to represent each signal

        in said aggregate collection in terms of at least one prototype dictionary element;

    d) calculating a parametric mean over the signal group of interest;

    e) for each signal in the collection, correcting each jittered parameter by an amount

        proportionate to its mean variation from the respective group parametric mean.

41. (previously presented) A method of automatically generating an application-specific

dictionary from a general-purpose dictionary, based upon on a collection of at least one signal,

comprising the steps of

    a) applying either the method of Claim 9 or the method of Claim 13 in order to represent

        each signal in said collection in terms of at least one prototype dictionary element;

   b) applying at least one threshold to extract a subset of the resulting prototype elements

   derived in (a); and

   c) creating a new dictionary based on said subset of extracted prototype elements and/or

   combinations thereof.

42. (previously presented) A method of automatically generating an application-specific

dictionary from a general-purpose dictionary, based upon on a collection of at least one signal,

comprising the steps of:

   a) parameterizing a dictionary of prototype signals in at least one variable, including at least

   the variable of position;

   b) designating a group of baseline signals;

   c) applying either the method of Claim 9 or the method of Claim 13 in order to represent

   each signal in said collection in terms of at least one prototype dictionary element;

   d) calculating a list of parametric mean prototype elements for the collection as a function of

   position by averaging all parameters except position;

   e) calculating the RMS amplitude over all possible positions of each of the parametric mean

   prototype elements within the baseline signal group;

   f) rescaling the coefficients derived in step (c) by the RMS baseline amplitude values;

   g) applying at least one threshold to extract a subset of the resulting prototype elements

   derived in (c); and

h) creating a new dictionary based on said subset of extracted prototype elements and/or combinations thereof.

43. (previously presented) The method of Claim 42, wherein the designated baseline signal group includes at least one signal from the target collection of signals to be processed.

44. (previously presented) A method of automatically sorting novel data based upon a collection of at least one previous group of related data, comprising the steps of

a) applying either the method of Claim 9 or the method of Claim 13 in order to represent each data signal in said collection in terms of at least one prototype dictionary element;

b) applying at least one threshold to extract a subset of the prototype elements derived in (a); and

c) determining an inner product between each novel data signal and the sub-selected prototype elements derived in (b).

45. (currently amended) A method of automatically sorting novel data based upon a collection of at least one previous group of related data, comprising the steps of:

a) parameterizing a dictionary of prototype signals in at least one variable, including at least the variable of position;

b) designating a group of baseline signals;

c) applying either the method of Claim 9 or the method of Claim 13 in order to represent each signal in said collection in terms of at least one prototype dictionary element;

d) calculating a list of parametric mean prototype elements for the collection as a function of position by averaging all parameters except position;

e) calculating the RMS amplitude over all possible positions of each of the parametric mean prototype elements within the baseline signal group;

f) rescaling the coefficients derived in step (c) by the RMS baseline amplitude values;

g) applying at least one threshold to extract a subset of the prototype elements derived in (c); and

h) determining an inner product between each novel data signal and the sub-selected prototype elements derived in step (g).

46. (previously presented) The method of Claim 45, wherein the designated baseline signal group includes at least one signal from the collection of previous groups of related data.